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Sonika Kravann Ung

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LOMA LINDA UNIVERSITY
School of Behavioral Health
in conjunction with the
Faculty of Graduate Studies

Role of Cultural and Psychological Factors Influencing Diabetes
Treatment Adherence

by

Sonika Kravann Ung

A Dissertation submitted in partial satisfaction of
the requirements for the degree
Doctor of Philosophy in Clinical Psychology

September 2017

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Each person whose signature appears below certifies that this thesis in his/her opinion is adequate, in scope and quality, as a thesis for the degree Doctor of Philosophy.

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ABBREVIATIONS

ADA	American Diabetes Association
CDC	Centers for Disease Control and Prevention
CFI	Comparative Fit Index
CI	Confidence Interval
DSME	Diabetes Self-Management Education
DSMQ	Diabetes Self-Management Questionnaire
HbA1c	Hemoglobin A1c
IRB	Institutional Review Board
MCSD	Marlowe-Crowne Social Desirability
ML	Maximum Likelihood
MI	Motivational Interviewing
RMSEA	Root Mean Square Error of Approximation
S-B	Satorra-Bentler
SD	Standard Deviation
SDSCA	Summary of Diabetes Self-Care Activities scale
SES	Socioeconomic Status
SEM	Structural Equation Models
SRMR	Standardized Root Mean Square Residual
T2D	Type 2 Diabetes

ABSTRACT OF THE DISSERTATION

Role of Cultural and Psychological Factors Influencing Diabetes Treatment Adherence

by

Sonika Kravann Ung

Doctor of Philosophy, Graduate Program in Clinical Psychology

Loma Linda University, September 2017

Dr. Hector Betancourt, Chairperson

Chronic diseases are the leading causes of disability worldwide although health complications can be prevented with lifestyle change (CDC, 2013). Type 2 diabetes is a growing global epidemic, and its prevalence is predicted to increase from 6.4% (285 million adults) in 2010 to 7.7% (439 million adults) by 2030 (Shaw, Sicree, & Zimmet, 2010). Given the reality of cultural diversity in contemporary society, the aim of this study was to address the need for research that integrates *both* cultural and psychological factors with behaviors central to diabetes control among culturally diverse populations (Betancourt & López, 1993; Betancourt, Flynn, Riggs, & Garberoglio, 2010).

Based on Bandura's theory of self-efficacy (1977a; 2004), it was expected that self-efficacy would play a significant role in treatment adherence. Second, based on Betancourt's integrative model of culture, psychology, and behavior, cultural factors identified as relevant to diabetes control were expected to influence treatment adherence directly and/or indirectly through self-efficacy.

In support of hypotheses, results based on the analysis of structural equations indicated that cultural beliefs concerning susceptibility to social influence impacted diabetes self-care behaviors and HbA1c, a biological measure of adherence to treatment,

through diet self-efficacy. Specifically, diet self-efficacy was a function of the identified cultural factors and influenced adherence to treatment, which in turn impacted HbA1c.

Findings underscore the importance of examining the indirect effect of culture on behavior, rather than solely testing one-to-one relationships. Had only the direct effect been examined, findings would incorrectly conclude that culture had no effect on diabetes treatment adherence. As expected, results reflected an indirect effect of cultural beliefs about explicit social influence and susceptibility to social influence on diabetes treatment adherence. Specifically, explicit social influence had an indirect effect on both poor diabetes self-care and HbA1c. Future research should focus on specifying the role of sociodemographic factors that contribute to cultural beliefs about social influence and further clarify underlying mechanisms to explain the variability in diabetes treatment adherence.

CHAPTER 1

ROLE OF CULTURAL AND PSYCHOLOGICAL FACTORS INFLUENCING DIABETES TREATMENT ADHERENCE

Chronic diseases, such as diabetes, are the leading causes of disability worldwide despite the fact that health complications can be prevented with lifestyle change (Centers for Disease Control and Prevention [CDC], 2013). Type 2 diabetes (T2D) is a growing global epidemic, and its prevalence is predicted to increase from 6.4% (285 million adults) in 2010 to 7.7% (439 million adults) by 2030 (Shaw, Sicree, & Zimmet, 2010). Research in health psychology has demonstrated the importance of investigating psychological and cultural factors that influence health behavior relevant to diabetes treatment adherence (Al-Khawaldeh, Al-Hassan, & Froelicher, 2012; Hatcher & Whittemore, 2006; Skaff, Mullan, Fisher, & Chesla, 2003). Given the reality of cultural diversity in contemporary society, there is a need for research that integrates psychological as well as cultural factors, in order to account for the complexity of relations among factors influencing health behavior (Betancourt & López, 1993; Betancourt, Flynn, Riggs, & Garberoglio, 2010). This necessitates the use of theoretical models that integrate sociodemographic, cultural, and psychological factors in order to more effectively examine the inherent complexity of health behaviors (Amador, Flynn, & Betancourt, 2015; Gallo, Smith, & Cox, 2006).

The aim of this study was to examine the structure of relations among sociodemographic, cultural, and psychological factors influencing health behaviors relevant to the control of diabetes among a culturally diverse population. The role of psychological factors found to influence adherence to treatment was studied within the

context of variations in cultural factors identified as relevant to diabetes. First, based on Bandura's theory of self-efficacy (1977a; 2004), it is expected that self-efficacy will play a significant role in treatment adherence among mainstream as well as culturally diverse individuals with T2D. Second, based on Betancourt's integrative model of culture, psychology, and behavior, it is expected that cultural factors identified as relevant to the control of diabetes will influence treatment adherence directly and/or indirectly through self-efficacy and related psychological factors.

In the following sections, the relevant aspects of Bandura's theory of self-efficacy and Betancourt's integrative model are reviewed to highlight the conceptual foundations of the proposed study. Then, evidence from previous research as well as preliminary findings supporting the propositions and corresponding rationale are examined.

Theoretical Foundations for the Proposed Study

As noted above, managing T2D is dependent on lifestyle change (CDC, 2013). Change becomes difficult if people view themselves as incapable of managing a different behavior, or perceive behavioral change as too much effort. Bandura's theory of self-efficacy explains how behavior change becomes more likely, and is defined as how well an individual can execute a course of action in order to deal with a challenging situation (Bandura, 1982; Bandura, 2004). Efficacy is reinforced by observing the effects of one's actions rather than from examples provided by others. Self-efficacy is synthesized over long periods of time in order to establish patterns that produce desired behavioral outcomes. The rationale for including self-efficacy in the proposed study is due to the

fact that changing health behavior requires continually facing challenges in order to gain positive health outcomes in the long run.

According to Bandura's self-efficacy theory, lasting changes in self-efficacy and behavior are achieved by increasing how capable a person feels (Bandura, 1977a). Capabilities increase once a person can reduce emotional arousal to former threats, which consequently increases self-directed mastery and coping skills. If independent performance is well executed, then success reinforces self-competency and the expectation of future successes. Greater levels of perceived self-efficacy produce greater changes in behavior. In fact, high perceived self-efficacy is a better predictor of behavior toward unfamiliar threats than past behavior. Bandura's theory of self-efficacy has been consistently supported across a wide range of behaviors (Bandura, 1986; Bandura, 1990; Bandura, 2004), and recently has been successfully applied to health behaviors (Lorig et al., 2001; Martins & McNeil, 2009). Therefore, for the purpose of this study, self-efficacy theory is expected to be a reliable predictor of health behavior. However, solely examining self-efficacy would disregard important cultural and related psychological variables that are also likely to contribute to health behavior. For instance, health behavior can be compromised or supported by important people in one's life. Bandura (2004) acknowledged that health is influenced by environmental, political, economic, and *social-cultural* conditions. In addition, there is conceptual and empirical evidence suggesting that in a multicultural society, self-efficacy is likely to be influenced by cultural factors.

Including cultural and sociodemographic factors are necessary to explain the differences observed among culturally diverse populations in health behavior. In order to

examine the complexity of health behavior among culturally diverse populations, this study is guided by Betancourt's Integrative Model for the Study of Culture, Psychological Factors, and Behavior adapted for the study of health behavior (Betancourt & Flynn, 2009; Betancourt et al., 2010). This model integrates psychological factors, such as self-efficacy, while also accounting for the complexity of relations between such psychological factors, as well as sociodemographic and cultural factors expected to influence health behavior (see Figure 1). The model organizes variables that are conceived as determinants of health behavior from the most distal to the most proximal (moving from A to D).

A distinct characteristic of this model is that sociodemographic factors (e.g. ethnicity, religion, sexual orientation, socioeconomic status [SES]) are considered as *sources* of culture rather than a definition of culture (A), and culture (B) is instead conceptualized as shared beliefs, norms, values, and expectations (Betancourt & López, 1993). Within this model, cultural factors have the potential to influence health behavior (D) both directly and through psychological factors (C). Psychological factors, such as Bandura's theory of self-efficacy, have the most influence on health behavior because they are the most proximal determinants of behavior. In sum, this model highlights that culture, rather than any other categorical membership, captures important influences on health behavior, while also considering potential mediating psychological factors (Betancourt & Flynn, 2009).

This study utilized both Bandura's theory of self-efficacy and Betancourt's Integrative Model to examine health behavior among individuals with T2D. Considering the role of cultural factors in health behavior can better account for mechanisms that

impact variability in treatment adherence behaviors among individuals with T2D, and pave the way for research that examines the impact of socially shared beliefs on health behavior. By conceptualizing cultural and psychological factors as determinants of health behavior, the sequence of variables that both support and interfere with health behavior can be better identified and targeted for interventions.

Diet Adherence among Individuals with T2D

Improving health behaviors that affect treatment adherence is necessary to slow the global epidemic of T2D. Diet adherence is a cornerstone of achieving appropriate glucose levels and preventing diabetes-caused complications (Lim, Park, Choi, Huh, & Kim, 2009; Woerle et al., 2007). Uncontrolled glucose, which is often measured by an HbA1c of 6.5 or higher (Florkowski, 2013; World Health Organization, 2011), can eventually result in severe health problems such as nerve death (neuropathy), blindness (retinopathy), kidney disease, kidney failure, heart disease, stroke, and cell death that can result in limb amputations. Even though dire health consequences can be mitigated by consuming approximately three to five servings of fruit and vegetables per day, as well as reducing sugar and saturated fat intake, adherence to recommended diet plans have been one of the most cited patient-management challenges among T2D patients (Stewart et al., 2007; World Health Organization Diabetes Fact Sheet, 2013). It has been estimated that only 33% of all patients adhere to their recommended diet consistently (Albright, Parchman, & Burge, 2001), raising pressing questions about what factors may improve treatment adherence.

Sociodemographic Influences on Diet Adherence

Improving treatment adherence among T2D patients also requires an examination of the possible causes of health disparities between ethnic and socioeconomic groups. In the United States, ethnic minority status has been associated with worse overall health outcomes (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010). Regional differences in T2D underscore the need for research to take place in California, which has one the fastest growing rates of newly diagnosed adults in the United States. Recent polls reflect wide variability between counties within California, which are also influenced by other factors such as SES and ethnic minority status. The prevalence of T2D in counties that will be examined by this study range from 7.2% (95% CI = 6.5, 8.0; Los Angeles county) to 8.8% (95% CI = 6.4, 11.2; San Bernardino county), in comparison with an overall prevalence of 8.4% in California, or one in twelve adults (Conroy, Lee, Pendleton, & Bates, 2014).

As noted above, prevalence rates vary widely when accounting for ethnicity. Notably, Latino, African American, American Indian, Alaska Native, Asian American, and Pacific Islander adults have twice the prevalence of T2D in comparison to Anglo adults. In comparison to Anglo adults, mortality rates from T2D among African American and Latino adults are twice as high (Conroy et al., 2014). Latinos also have disproportionately higher baseline glucose levels, prevalence of T2D, younger age of onset for diabetes, are less likely to receive health care, and subsequently, are more likely to experience T2D-related complications (CDC, 2009; Chukwueke & Cordero-MacIntyre, 2010; Weinstock et al., 2011). Even though health risks caused by T2D are largely controllable with behavioral modification, the disease remains among the top five

causes of death among Latinos in the US (Chukwueke & Cordero-MacIntyre, 2010). In addition, a 10-year longitudinal study found that ethnic minorities are overrepresented in residential environments that have limited access to healthy food and physical activity, making them more likely to develop T2D (Christine et al., 2015).

Disparities also occur across socioeconomic levels, and T2D patients are overrepresented at low education and income levels (Cusi & Ocampo, 2011; Misra & Lager, 2007). Low SES is associated with low diabetes knowledge and a decreased likelihood of using preventive health care services, which results in a higher need for specialized care and higher risk factor profiles due to uncontrolled glucose levels (Zgibor & Songer, 2001). Regarding education attainment specifically, the prevalence of T2D is higher among Latinos with a high school versus college education level (CDC, 2009). Furthermore, not being Anglo, older age, and having less than a high school education predicted a significantly greater likelihood of diabetes (Cheung et al., 2009). Although the role of education is an important factor to consider in health disparities, poverty is more strongly associated with T2D prevalence than education, even when accounting for ethnicity (Robbins, Vaccarino, Zhang, & Kasl, 2001). Such findings indicate that disparities are partially explained by education level and are primarily explained by income.

Sociodemographic factors, such as ethnicity, SES, and region, are often directly correlated to health disparities and outcomes. However, the differences in health behavior and outcomes noted above can be more effectively targeted in interventions when considering the role of cultural and psychological factors. Betancourt's Integrative Model and related research (Betancourt, Flynn, & Ormseth, 2011; Flynn et al., 2011) suggest

that health behaviors such as continuity of care are more thoroughly explained when the structure of relations among sociodemographic, cultural, and psychological factors are examined. Guided by this theoretical model, evidence of the psychological factors that are considered to be the most proximal influence to diet adherence will be examined within the context of social and cultural factors, rather than one-to-one comparisons of sociodemographic factors and treatment adherence. Based on an integrative theoretical approach, this study examined people with T2D in the context of cultural and psychological factors to clarify what influences treatment adherence (or non-adherence.)

Self-Efficacy and Treatment Adherence

Of particular relevance to health behaviors in general, and diet adherence in particular, are the robust findings regarding the impact of self-efficacy as proposed by Bandura (2004). As noted above, differences in diet adherence are often influenced by a T2D patient's motivation to manage behaviors under a variety of competing circumstances (e.g. depression, anxiety, bad weather, low interest). Self-efficacy, defined here as having enough confidence to reach a desired goal (Bandura, 1977a), has become increasingly relevant to chronic diseases such as T2D because it promotes self-management behaviors (Bandura, 2004; Heisler, Piette, Spencer, Kieffer, & Vijan, 2005). According to previous research (Flynn et al., 2011), psychological factors have a stronger direct influence on health behavior over more distal factors, such as SES and ethnicity, which is emulated in research findings on self-efficacy. As noted above, low SES has been found to hinder overall treatment adherence among ethnic minorities (Mansyur, Pavlik, Hyman, Taylor, & Goodrick, 2012), which may be countered if people with T2D

have high self-efficacy. For example, Latinos with T2D high in self-efficacy have better overall treatment adherence, medication access, exercise levels, self-monitoring glucose frequency, and more consistent foot care (Julien, Senecal, & Guay, 2009; Kollannoor-Samuel et al., 2011; Sarkar, Fisher, & Schillinger, 2006; Ung, 2015). Although self-efficacy has been found to represent a significant and generalizable mechanism through which differences in health behaviors can be explained, Bandura's self-efficacy theory also suggests that health is the product of complex social, environmental, political, and economic conditions, suggesting that self-efficacy related to chronic disease management is affected considerably by external social factors (i.e. support from friends/family members) and socially shared cultural factors.

Cultural factors that influence treatment adherence may come to the forefront in certain situations where you feel susceptible, such as at work lunches or family dinners, which is particularly relevant for some cultural groups (Kollannoor-Samuel et al., 2011). On a broader scale, the influence of one's community, such as traditions of eating unhealthy foods in large portions, may also contradict self-management behaviors, and eventually lead to poorer self-efficacy (Bandura, 2004). Perceived social support and high self-efficacy may serve as protective factors in such situations. Based on the research available, it is apparent that cultural and psychological factors must be integrated to examine treatment adherence, as investigated by this study.

Cultural Factors that Influence Treatment Adherence

Although self-efficacy and perceived social support may account for individual qualities that affect diet adherence, these psychological factors are likely to be influenced

by a broader network of socially shared beliefs, values, norms, expectations, and practices within a group, community, or society at large (Betancourt & López, 1993; Betancourt et al., 2010). To further this point, the evidence reviewed above supports the proposition that self-efficacy influences how confident individuals feel adhering to their treatment. But what happens when expectations within a culture contradict psychologically protective factors, such as when food is eaten to please your friends or family members? Culturally shared beliefs have the potential to both promote and impede health behavior. Therefore, when the influence of culture is not included in research, explanations for the causes of treatment adherence could be misleading. Research on the influence of cultural factors on diet adherence may elucidate some reasons for the variability in treatment adherence, and highlight the need to integrate cultural and psychological factors when examining health behavior.

For instance, general cultural factors that have been related to health behaviors in the extant literature include collectivism (i.e. duty to one's in-group) and familism (i.e. putting one's family before oneself) because they contribute to one's confidence to make behavioral changes (Oyserman, Coon, & Kemmelmeier, 2002; Schwartz, 2007). Although general cultural factors influence health behavior, previous research has highlighted the need to identify cultural factors within specific groups (e.g. ethnic minority or socioeconomic groups) from the bottom-up in order to identify important elements of subjective culture that influence health behavior, and ultimately, contribute to more tailored interventions (Betancourt et al., 2010).

The bottom-up approach (Betancourt et al., 2010) is one way to identify cultural factors that are unique to certain groups by utilizing a three-phase process. In the first

phase, in-depth semi-structured interviews are conducted to identify cultural factors (e.g. socially shared norms, values, expectations, and beliefs) relevant to the health behavior of interest, with sampling stratified across demographic categories (e.g. age, gender, ethnicity, religion, and socioeconomic status). The second phase includes developing items and conducting exploratory factor analyses of cultural elements that emerged in phase 1. Phase 3 includes conducting confirmatory factor analyses and psychometric validation of the developed scale. This approach was used to identify cultural factors specific to Native American and mainstream Chilean T2D patients in previous research conducted in Chile (Ung, Betancourt, & Flynn, 2014).

Cultural Beliefs about Social Influence

Using a mixed-methods, bottom-up cultural research approach to instrument development (Betancourt et al., 2010), preliminary research conducted in Chile identified specific cultural factors central to diet adherence among Type 2 diabetic Native American and mainstream populations. Guided by Betancourt's Integrative Model, this study tested the indirect relationship of cultural factors on diet adherence through self-efficacy. One of the factors identified using the bottom-up approach, cultural beliefs about susceptibility to social influence, was found to be associated with low self-efficacy for adhering to a prescribed diet. Type 2 diabetes patients with high susceptibility to social influence had more difficulty refusing food or beverages that were offered as a sign of affection (Ung et al., 2014). This preliminary evidence highlights the importance of considering culture when examining diet adherence. This cultural factor identified, which

remains to be tested in the United States, is part of the focus of attention of this study among culturally diverse diabetics in the United States (Ung, 2015).

The research addressing cultural factors that influence diet among culturally diverse people with T2D in the United States (i.e. socially shared values, beliefs, and expectations) is often qualitative, and unfortunately not typically developed into cultural instruments. However, research has identified group differences among Latinos across psychological and behavioral factors. For example, some Latino families incorporate unhealthy food such as chips and soda and begin to include fewer fruits and vegetables the more acculturated they become to the United States (Andaya, Arredondo, Alcaraz, Lindsay, & Elder, 2011). Similar patterns were found in studies comparing diet among Pima Indians in Mexico to Pima Indians in the United States (Ravussin, Valencia, Esparza, Bennett, & Schultz, 1994; Schulz et al., 2006). Among African American populations, regional traditions of eating high sodium meals were cited as a primary barrier to healthy diets. Furthermore, reducing sodium was also confused with reducing sugar consumption (Mansyur, et al., 2012).

Unhealthy diets also occur when experiencing psychosocial stressors. Native Hawaiians and Pacific Islanders suffering from acculturative stress that results in depression also have the highest energy intake (i.e. most food consumed) compared with all other minority populations (King et al., 2012). Latinos suffering from depression may stop eating consistently, or consume foods that disrupt their blood sugar levels (Cabassa, Hansen, Palinkas, & Ell, 2008). Once T2D is diagnosed, some Latinos believe that folk remedies, such as consuming prickly pears (nopal) and aloe, will lower blood sugar levels (Hatcher & Whittemore, 2006). Among some Chinese Americans with T2D, foods are

also consumed in patterns designed to balance the body's energy (not temperature), and are grouped as hot, cold, or toxic. Furthermore, herbal medicines, folk healing, and home remedies may be sought prior to mainstream healthcare due to the socially shared emphasis on collectiveness and harmony rather than autonomy and individual decision making expected in Western medicine (King et al., 2012). Within the context of Betancourt's Integrative Model, however, differences at the sociodemographic level (i.e. ethnicity) remain the most distal influence on behavior.

Previous studies conducted in the U.S. among ethnically diverse populations have found that social influence can negatively impact diet adherence. For example, T2D patients found diet adherence to be difficult when their children would offer them food outside of their prescribed diet (Laroche et al., 2009). Among some immigrant Chinese Americans with T2D, the symptoms of fatigue, sweatiness, and irritability associated with uncontrolled glucose were often considered disruptive to social harmony. Furthermore, some immigrant Chinese Americans felt incredibly limited in contexts where food was being shared, such as when eating out, at banquets, or cultural celebrations (Chesla, Chun, & Kwan, 2009). Similarly, diet adherence was considered difficult when it conflicted with the family's and extended family's diet among some Latinos (Ramal, Petersen, Ingram, & Champlin, 2009). African Americans and Latinos with T2D have also been found to endorse fatalistic beliefs, or resign to an external locus of control that impedes disease management due to the belief that health outcomes are uncontrollable (Chlebowy, Hood, & Lajoie, 2010; Skaff et al., 2003). Furthermore, among some African Americans, adhering to a diabetic diet was difficult due to family pressure to eat unhealthy food, belief in a lack of personal control, and the belief that

low-fat and sugar free foods lacked flavor (Chlebowy et al., 2010; El-Kebbi, Bacha, & Ziemer, 1996). Additionally, in line with the cultural factor identified in Chile that is the focus of this study, qualitative research in the United States has identified that Latinos struggle with adhering to their diet specifically when friends and family offer foods to them and they cannot say no (Early, Shultz, & Corbett, 2009).

Taking these findings into account, some socially shared norms may actually act as a significant barrier for diet adherence among T2D patients, such as temptation to eat unhealthy food, eating out, feeling deprived, time constraints, and social events (Marcy, Britton, & Harrison, 2011). Although not the focus of the proposed study, it is also important to note that socially shared norms can be protective if they reinforce health behaviors. For example, normative familial roles that may be protective for diet adherence among Latinos included women following their diet because it would benefit her family if she remains healthy and controls her diabetes (Early et al., 2009).

This study included an adapted measure intended to examine a cultural factor that represents barriers, based on preliminary research conducted in Chile, and related evidence from research in the United States. Based on the research reviewed, cultural beliefs about social influence may be relevant to ethnically diverse populations in the United States. Because this cultural factor has not been tested in the United States, it is important to gather data on a broad range of ethnic minority groups as well as the mainstream population to see if it is a specific or generalizable cultural factor. By testing cultural beliefs about social influence among culturally diverse people with T2D in the United States, the objective is to account for cultural and psychological mechanisms that impact variability in treatment adherent health behaviors, and pave the way for more

comprehensive research that examines the impact of cultural, psychological, and behavioral phenomena on diabetes-related health outcomes.

Aims

The primary aim of this study was to examine the role of, and structure of relations among, sociodemographic, cultural, and psychological factors influencing health behavior relevant to the control of diabetes among various ethnic and SES populations. Grounded in Betancourt's Integrative Model for the Study of Culture, Psychological Factors, and Health Behavior, cultural beliefs (e.g. beliefs pertaining to social influence), psychological factors (e.g. self-efficacy), and treatment adherence were examined. Within this theoretical framework, both the direct and indirect effects of cultural beliefs that may inhibit treatment adherence can be examined (see Figure 1).

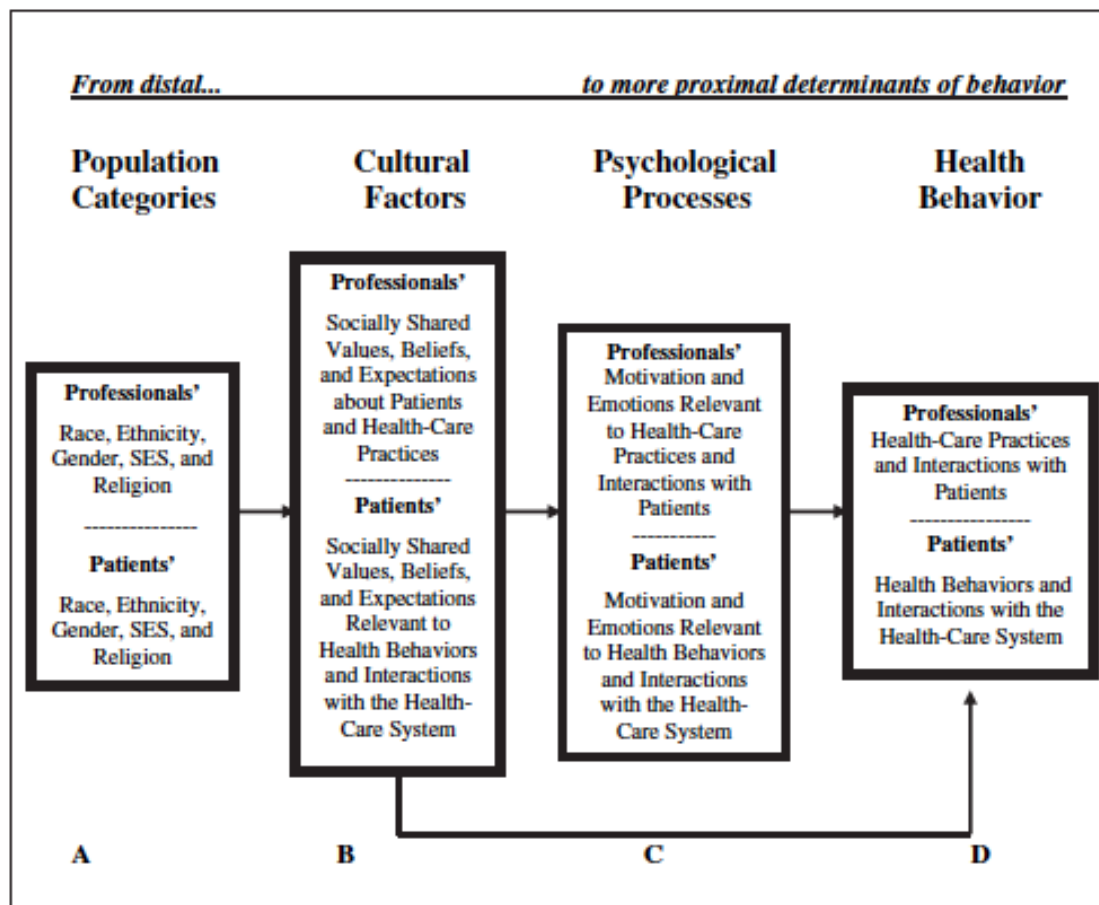


Figure 1. Betancourt's Integrative Model of Culture, Psychological Factors and Behavior adapted for the study of health behavior (Betancourt & Flynn, 2009).

In addition, Bandura's conception of the role of self-efficacy will be examined, in order to capture how self-management is influenced by culture and the extent to which it mediates the effect of culture on treatment adherence among individuals with T2D.

Notably, the integrative framework allows for the inclusion of other well-established psychological theories (i.e. Bandura's self-efficacy), broadening its explanatory effects by placing it in the context of culture. Examining the components of treatment adherence from an integrated theoretical standpoint may better define the process by which diabetic patients do or do not adhere to prescribed diets, thus reducing the risk of future health

complications. In doing so, variations in self-efficacy erroneously attributed to race or ethnicity may be more accurately accounted for by variations in the corresponding cultural factor.

In line with Betancourt's Integrative model, the structure of relations among sociodemographic (e.g. ethnicity, SES), cultural (e.g. explicit social influence and susceptibility to social influence), and psychological factors (e.g. diet self-efficacy) was tested as predictors of diet adherence and HbA1c among culturally diverse individuals with T2D.

Hypotheses

This study tested one general and two specific hypotheses. For the general hypothesis, a causal model based on the proposed structure of relations and theory-based relations among sociodemographic, cultural, and psychological factors as antecedents of treatment adherence behavior and HbA1c were expected to fit the data well (i.e. hypothesis 1). Secondly, it was hypothesized that higher levels of self-efficacy result in more adherence to treatment (i.e. hypothesis 2). Thirdly, it was hypothesized that cultural beliefs concerning explicit social influence and susceptibility to social influence impact treatment adherence directly and/or indirectly through diabetes self-efficacy (i.e. hypothesis 3).

CHAPTER 2

METHODS

This study was part of a larger research program investigating cultural and psychological factors relevant to diabetes management.

Participants

A total of 179 individuals with T2D (Latino; $n = 76$, Anglo; $n = 62$, African American; $n = 22$, Asian American; $n = 12$, Multi-ethnic participants; $n = 7$) participated in this study, who were primarily from Southern California. Four participants were excluded from statistical analyses due to missing data resulting in a sample of 175. The mean age was 55.63 (SD = 13.98), 64% were women, and average year of education was 13.32 (SD = 3.79). Participants were recruited from varying demographic characteristics in an effort to obtain a sample that is representative of the region's diversity (see Table 1). Research approval was obtained from Loma Linda University's Institutional Review Board (IRB protocol #5150309). Recruitment took place from October 2016 to March of 2017. Internet-based convenience sampling was conducted via social media outlets (i.e. Twitter, Facebook, Reddit), community-based events for diabetes, and diabetes treatment centers in Southern California. Recruitment took place in both English and Spanish. Inclusion/exclusion criteria consisted of having a diagnosis of T2D and being over the age of eighteen.

Table 1. Demographic characteristics of participants.

<i>n</i> = 179	<i>n</i> (%)
Ethnicity	
African American	22 (12.30)
Anglo	62 (34.60)
Asian American	12 (6.70)
Latino	76 (42.50)
Other	7 (3.90)
Annual Income	
<\$14,999	31 (17.30)
\$15,000-24,999	30 (16.80)
\$25,000-39,999	28 (15.60)
\$40,000-59,999	23 (12.80)
\$60,000-79,999	16 (8.90)
> \$100,000	26 (14.50)
Missing	6 (3.40)
Education	
Less than high school	33 (18.40)
High school	37 (20.70)
1-2 years of college	45 (25.14)
3-4 years of college	35 (19.55)
> 4 years of college	27 (15.08)
Missing	2 (1.1)
Years Diagnosed with T2D	
< 5	74 (42.60)
5 – 9	26 (14.50)
10-14.9	24 (13.40)
15-19.9	17 (9.50)
20-25	21 (11.70)
≥ 26	12 (7.00)
Missing	5 (2.80)
Nationality	
United States	138 (77.10)
Foreign-Born	41 (22.90)
Language	
English	158 (88.27)
Spanish	21 (11.73)
Gender	
Female	115 (64.20)
Male	53 (19.60)
Age Mean (SD)	
Missing	18 (10.05)

Procedures

After permission from key personnel was obtained for online and email-based recruitment, English and/or Spanish email introductions were distributed to participants with a link to the instrument, which utilized Qualtrics Software. Participants were then asked to electronically provide informed consent (see Appendix E). Paper/pencil instruments were also provided at Diabetes Education Classes and Diabetes Support Groups in either English or Spanish. Informed consent forms were provided in-person by research assistants. Participants were then asked to complete the instrument (see Appendix A-E). If the participant chose to discontinue at any point, he/she could withdraw without penalty. Upon instrument completion, the participant was given the opportunity to enter a drawing for one of three \$50 gift cards. This drawing was conducted after sampling goals were reached and notifications were made by an uninvolved representative from the Department of Psychology.

Measures

All scales were previously adapted and psychometrically validated in Spanish (De Castillo, 2010) and modified to reflect Spanish word-choice typical to the region to ensure comprehension for the participants.

Sociodemographic Factors

Demographic information including gender, age, income, education, marital status, and years diagnosed with diabetes were based on participant self-report (see

Appendix F). Participants indicated their income based on five income categories.

Education was reported in total years obtained.

Cultural Beliefs about Social Influence

Preliminary research employing the mixed methods cultural research approach to instrument development (Betancourt et al., 2010) identified cultural beliefs about social influence as an important cultural variable relevant to treatment adherence among Latino T2D patients in Chile (Ung et al., 2014). The original three-item scale was expanded for the present study to include six items designed to assess two aspects of social influence: explicit social influence (e.g. when friends or family members pressure you to eat) and susceptibility to social influence (e.g. when you cannot refuse food offered as a sign of affection; see Appendix G). Item responses were placed on a Likert scale anchored at the extremes from 1 (strongly disagree) to 7 (strongly agree). Exploratory factor analysis of the six-item scale resulted in a two-factor solution with three items reflecting explicit social influence ($\alpha = .80$) and three items reflecting susceptibility to social influence ($\alpha = .83$).

Diet Self-Efficacy

The previously validated 6-item diet self-efficacy scale (Ung et al., 2014; see Appendix H) was used in the present study. This scale was originally developed by De Castillo (2010) based on items from the Eating Self-Efficacy Scale (Glynn & Ruderman, 1986), Weight Efficacy Life-Style Questionnaire (Clark, Abrams, Niaura, Eaton & Rossi, 1991) and the Confidence in Diabetes Self-Care Scale (Van der Ven, Weinger, Pouwer,

Adér, Van der Ploeg et al., 2003). Participants were asked to indicate “how confident are you that you can” 1) follow the diet when other people insist you eat other things, 2) follow the suggested diet to control your diabetes, 3) avoid food that is not part of your diet, 4) follow the diet when others eat food or consume drinks not part of the diet, 5) follow the diet when at a party, and 6) follow the diet when you are worried or anxious. Item responses were placed on a Likert scale anchored at the extremes from 1 (not confident) to 7 (very confident). High scores reflect greater capability of maintaining a healthy diet (Ung et al., 2014). Two items were dropped from the original scale due to results from the measurement model, which suggested that eliminating the following items would improve model fit: “follow the diet when other people insist you eat other things” and “follow the diet when others eat food or consume drinks not part of the diet.” The resulting 4-item diet self-efficacy scale had excellent reliability ($\alpha = .92$).

Diabetes Treatment Adherence

Two items were adapted from existing scales to assess diabetes treatment adherence. The first item, “how many of the past seven days has your diabetes self-care been poor?” was adapted from the Diabetes Self-Management Questionnaire (DSMQ; Schmitt et al., 2013). Participants indicated the number of days per week (i.e. 0 to 7 days) their diabetes self-care was poor, with higher scores reflecting poorer treatment adherence. The second item, “in general, how many times per week do you follow a healthy eating plan” was adapted from the Summary of Diabetes Self-Care Activities scale (SDSCA; Toobert, Hampson, & Glasgow, 2000; see Appendix I). Higher scores reflected higher levels of dietary treatment adherence.

HbA1c

Participants were asked to report their most recent HbA1c, which is an indication of chronic glycaemia over a 120-day lifespan of the red blood cell (Florkowski, 2013). HbA1c is considered a biological marker of adherence to diabetes treatment, including diet, exercise, and medication. The cut-off for a diagnosis of T2D is now 6.5% (World Health Organization, 2011). Although international standards for glycemic control have not yet been agreed upon (Florkowski, 2013; World Health Organization, 2011), the American Diabetes Association (ADA) recommends that people with T2D should strive for HbA1c levels <7.0% in order to establish good glycemic control (ADA, 2013). Patients at low risk for health complications are recommended to have a more stringent goal of <6.5%. Patients at high risk for health complications are recommended to have a less stringent goal of <8.0%.

Social Desirability

Social desirability was measured with the Marlowe-Crowne Social Desirability short form, version C (MCSD; Reynolds, 1982; Zook & Sipps, 1985). The MCSD is a 13-item scale that utilizes a true-false response format to assess the impact of social desirability on self-report measures such as “no matter who I am talking to, I’m always a good listener.” This scale was recoded in line with Crowne and Marlowe (1960) so that a cumulative score reflected participants who were endorsing a socially desirable response style. Higher scores reflected higher levels of socially desirable responding.

CHAPTER 3

RESULTS

Preliminary Analyses

Prior to testing study hypotheses, an examination of potential covariates was conducted using IBM SPSS 24.0. Age was negatively correlated with cultural beliefs about explicit social influence ($r = -.166, p < .05$) and susceptibility to social influence ($r = -.193, p < .05$). Income was negatively correlated with poor diabetes self-care ($r = -.274, p < .01$). Length of time since diagnosis was positively correlated with poor diabetes self-care ($r = .201, p < .05$) and HbA1c ($r = .296, p < .01$). In addition, social desirability was positively correlated with diet self-efficacy ($r = .222, p < .01$) and negatively correlated with cultural beliefs about explicit social influence ($r = -.280, p < .01$) and susceptibility to social influence ($r = -.276, p < .01$). In order to maintain a simplified model without using up model degrees of freedom (Kammeyer-Mueller & Wanberg, 2003), the relevant covariates were partitioned from all study variables prior to analyses. Table 2 reflects the study variable means, standard deviations, and correlations after adjustment of covariates.

Table 2. Intercorrelation table of study variables.

	1.	2.	3.	4.	5.	6.
1. Explicit Social Influence	—					
2. Susceptibility to Social Influence	.402**	—				
3. Diet Self-Efficacy	.166*	-.129	—			
4. Good Diet Adherence	-.011	-.168*	.480**	—		
5. Poor Diabetes Self-Care	.000	.099	-.331**	-.313**	—	
6. HbA1c	.139	.062	-.054	-.035	.235**	—
Means (<i>SD</i>)	2.82(1.57)	4.22(1.72)	4.36(1.48)	4.52(1.86)	2.02(1.85)	7.57(1.99)

Testing Hypotheses

Hypotheses were tested with structural equation models (SEM) using v.14 of Statacorp (2015) for Macintosh and maximum likelihood estimation (ML). Data was examined with IBM SPSS 24.0 to establish normality, missing data, duplicated data, skew/kurtosis, and any outliers that were significantly affecting the data. A visual inspection of the study variables' histograms and Q-Q plots suggested that variables were non-normal, which was further assessed and confirmed by converted Z-scores for skew and kurtosis (Ghasemi & Zahediasl, 2012). SPSS' Missing Variable Analysis reflected that data appeared to be missing at random. Five multivariate outliers were located with the Mahalanobis distance test and removed from the data set. The data was checked for assumptions of ML and Heywood cases to ensure the model was admissible (Kline, 2011). Adequacy of fit was assessed using a Comparative Fit Index (CFI) of .95 or greater, a Standardized Root Mean Square Residual (SRMR) of less than .08 (Hu & Bentler, 1998), a Root Mean Square Error of Approximation (RMSEA) of less than .08 (Browne & Cudeck, 1993), the non-significant χ^2 goodness-of-fit statistic, and a ratio of less than 2.0 for the χ^2/df (Tabachnick & Fidell, 2012). The *Satorra-Bentler (S-B) χ^2* corrects for non-normal data and change values ($\Delta S-B\chi^2$) described throughout these SEM analyses were adjusted in line with Statacorp's (2015) recommendations. The SEM models utilized the constructs of cultural beliefs about social influence and diet-self efficacy as latent factors (see Figure 2).

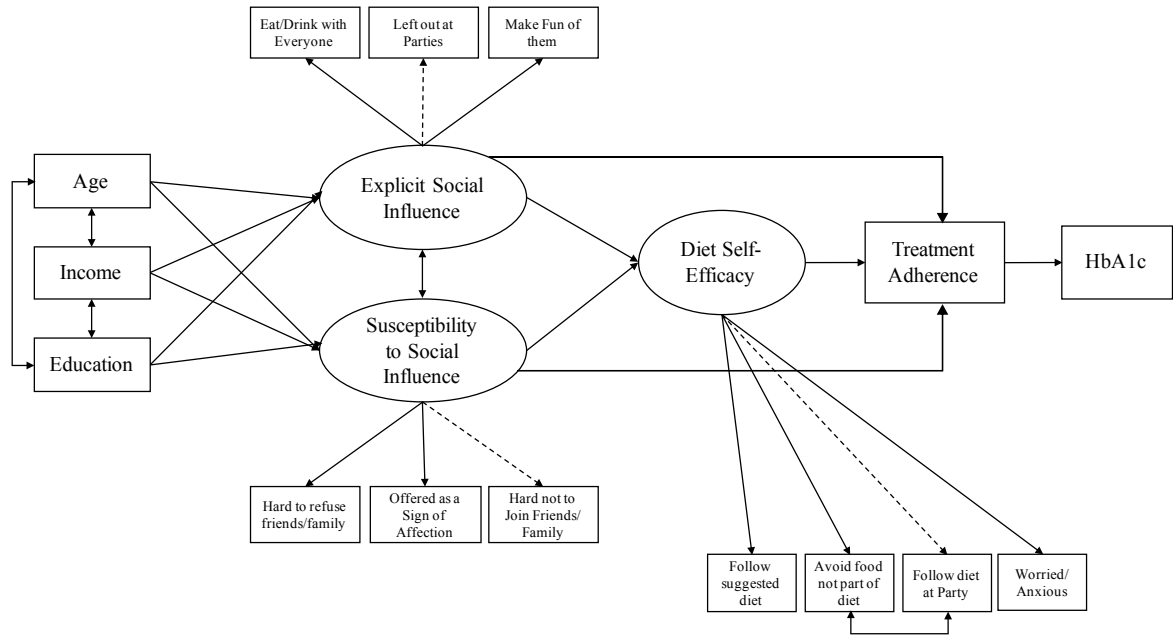


Figure 2. Proposed structural equation model for total sample.

The measurement model fit the data well: CFI = .974, *S-B* RMSEA = .054, SRMR = 0.057, *S-B* $\chi^2(40, n = 170) = 59.79, p = .023, \chi^2/df = 1.49$. Notably, the *S-B* χ^2 was significant, likely due to its sensitivity to sample size; therefore, other goodness of fit indices were weighted more heavily (Schermelleh-Engle, Moosbrugger, & Müller, 2003; Vandenberg, 2009).

Hypothesis 1

In order to test the general hypothesis, the variables “how many of the past seven days has your diabetes self-care been poor,” “in general, how many times per week do you follow a healthy eating plan,” and HbA1c were utilized as dependent variables. Based on correlation tables of sociodemographic variables (i.e. education, income, and age) were utilized as exogenous variables. The sociodemographic variables were then

dropped from the model due to the small effect they had on the cultural variables, indicating that it would be a more parsimonious model without them. Similarly, direct paths from the cultural factors to treatment adherence also had a small effect and were dropped from the model.

In support of hypothesis 1, a causal model based on the proposed structure of relations and theory-based relations among cultural and psychological factors as antecedents of poor diabetes self-care and HbA1c fit the data well: CFI = .973, *S-B* RMSEA = .048, SRMR = 0.059, *S-B* $\chi^2(50, n = 156) = 68.33, p = .043, \chi^2/df = 1.37$ (see Figure 3). Similarly, a causal model predicting adherence to a healthy diet also fit the data well, in line with the general hypothesis: CFI = .974, *S-B* RMSEA = .054, SRMR = 0.057, *S-B* $\chi^2(40, n = 156) = 59.79, p = .023, \chi^2/df = 1.49$. Notably, general diet adherence did not have a significant effect on HbA1c and that direct path was dropped from the model (see Figure 4).

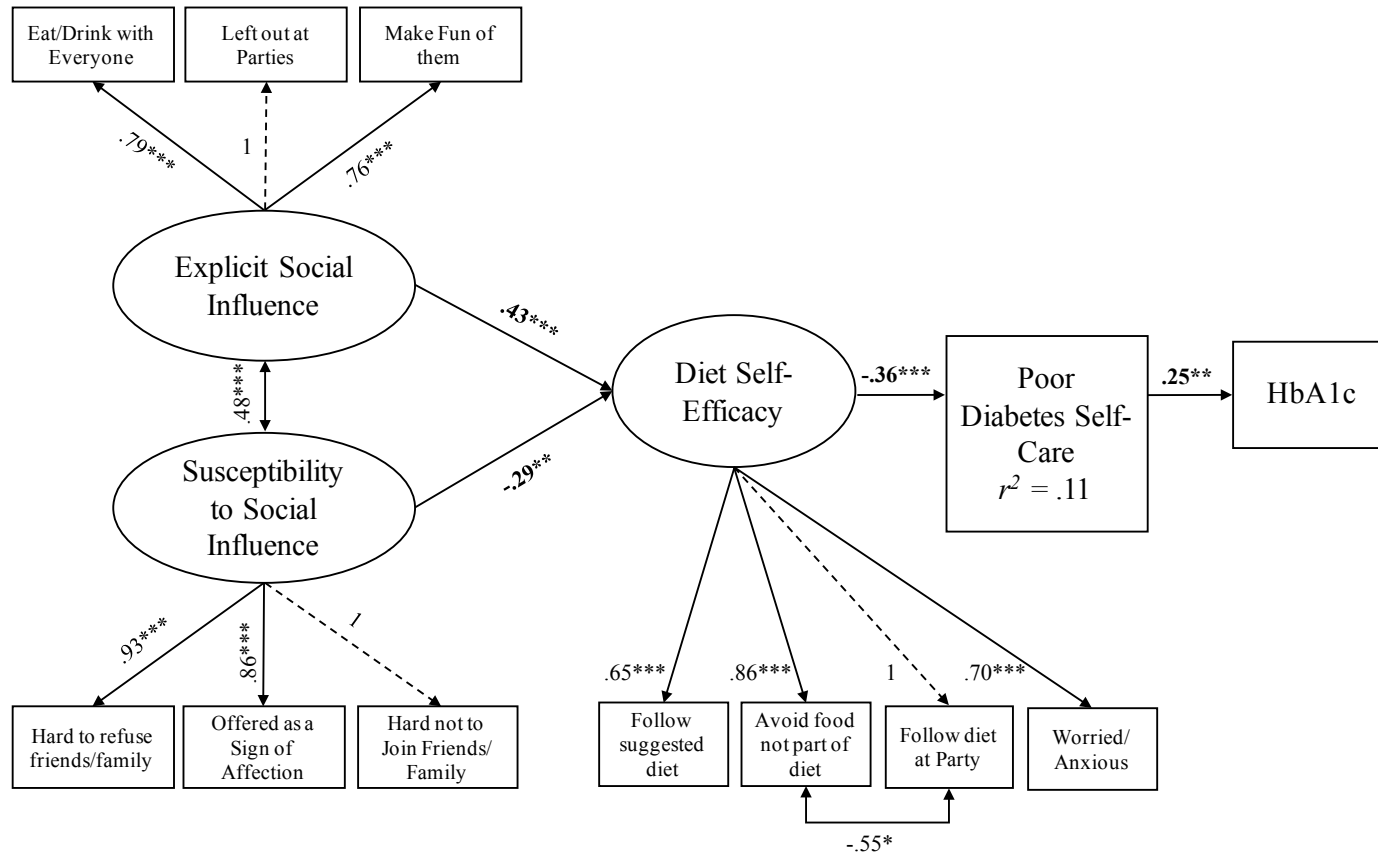


Figure 3. Structural equation model (total sample) for poor diabetes self-care and HbA1c.

CFI = .973, *S-B* RMSEA = .048, SRMR = 0.059, *S-B* $\chi^2(50, n = 156) = 68.33, p = .043, \chi^2/df = 1.37$. Indirect effect of explicit social influence on poor diabetes self-care through diet self-efficacy $\beta_{\text{indirect}} = -.15, p = .012$ (95% CI = -.276, -.034). Indirect effect of explicit social influence on HbA1c through diet self-efficacy $\beta_{\text{indirect}} = -.04, p = .044$ (95% CI = -.076, -.001). Indirect effect of susceptibility to social influence on poor diabetes self-care through diet self-efficacy $\beta_{\text{indirect}} = .11, p = .024$ (95% CI = .014, .200).

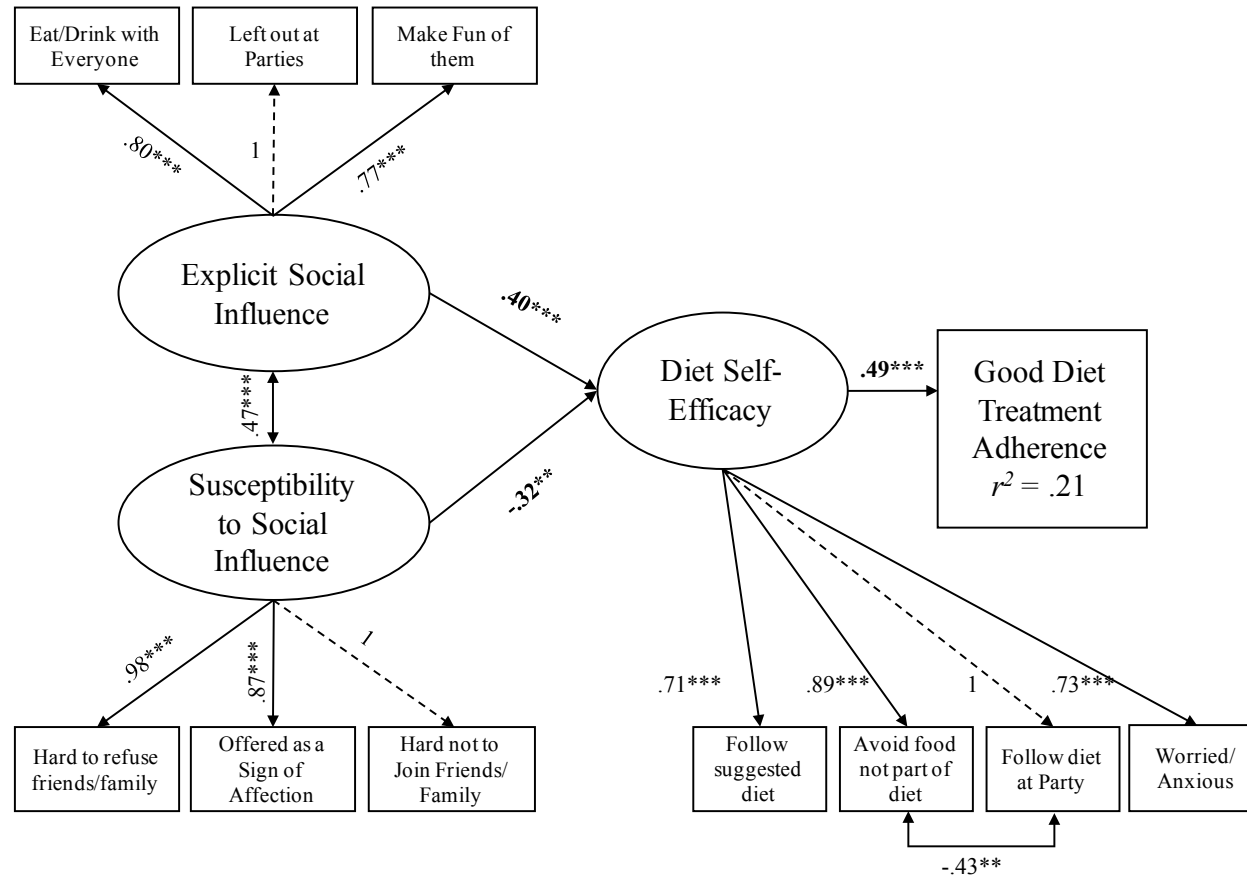


Figure 4. Structural equation model (total sample) for good diet treatment adherence.

CFI = .974, $S-B$ RMSEA = .054, SRMR = 0.057, $S-B \chi^2$ (40, $n = 156$) = 59.79, $p = .023$, $\chi^2/df = 1.49$. Indirect effect of explicit social influence on diet adherence through diet self-efficacy $\beta_{\text{indirect}} = .19$, $p = .002$ (95% CI = .074, .313). Indirect effect of susceptibility to social influence on diet adherence through diet self-efficacy efficacy $\beta_{\text{indirect}} = -.15$, $p = .002$ (95% CI = -.273, -.042).

Hypothesis 2

In support of hypothesis 2, higher levels of self-efficacy resulted in more diabetes treatment adherence. When assessing poor diabetes self-care and HbA1c as outcomes, cultural beliefs about social influence predicted scores on the diet self-efficacy scale: explicit social influence $\beta = .43, p < .001$ (95% CI = .217, .647); susceptibility to social influence $\beta = -.29, p = .005$ (95% CI = -.508, -.088). Similarly, when assessing healthy diet as an outcome, cultural beliefs about social influence were predictive of scores on the diet self-efficacy scale: explicit social influence $\beta = .40, p < .001$ (95% CI = .179, .612); susceptibility to social influence $\beta = -.32, p = .002$ (95% CI = -.528, -.156).

Hypothesis 3

In support of hypothesis 3, cultural beliefs concerning social influence and susceptibility to social influence impacted diabetes treatment adherence indirectly through diabetes self-efficacy. There was a significant indirect effect of cultural beliefs about explicit social influence on poor diabetes self-care $\beta_{\text{indirect}} = -.15, p = .012$ (95% CI = -.276, -.034) and HbA1c $\beta_{\text{indirect}} = -.04, p = .044$ (95% CI = -.076, -.001) through diet self-efficacy. Those who reported more explicit social influence also reported feeling more confident about adhering to their treatment, and in turn, those with lower self-efficacy reported poorer treatment adherence and less controlled glucose levels in general. In addition, there was also a significant indirect effect of cultural beliefs about susceptibility to social influence on poor diabetes self-care through diet self-efficacy $\beta_{\text{indirect}} = .11, p = .024$ (95% CI = .014, .200). Those who reported feeling less susceptible to social influence also reported feeling more confident about adhering to their treatment,

and in turn, those with lower self-efficacy reported poorer diabetes self-care in general. Poor diabetes self-care accounted for a notable proportion of the variance in the model ($r^2 = .11$).

Cultural beliefs about social influence also had a significant indirect effect on healthy diet adherence. There was a significant indirect effect of cultural beliefs about explicit social influence on healthy diet adherence through diet self-efficacy $\beta_{\text{indirect}} = .19$, $p = .002$ (95% CI = .074, .313). Those who reported more experiences of explicit social influence also reported feeling more confident about adhering to their diet, and in turn, reported higher diet adherence in general. In addition, there was also a significant indirect effect of cultural beliefs about susceptibility to social influence on diet adherence through diet self-efficacy $\beta_{\text{indirect}} = -.15$, $p = .002$ (95% CI = -.273, -.042). Those who reported feeling less susceptible to social influence also reported feeling more confident about adhering to their diet, and in turn, reported higher diet adherence in general. Good diet adherence accounted for a notable proportion of the variance in the model ($r^2 = .21$).

CHAPTER 4

DISCUSSION

This study found that cultural beliefs about susceptibility to social influence had an indirect effect on diet adherence and poor diabetes self-care through diet self-efficacy among a culturally diverse sample with T2D. Specifically, cultural beliefs about explicit social influence had an indirect effect on both poor diabetes self-care and HbA1c. Findings underscore the importance of examining the indirect effect of culture on behavior, rather than solely testing one-to-one relationships. Support for hypotheses elucidated how specific cultural beliefs indirectly effect health behavior. Had cultural factors only been measured as a direct effect on treatment adherence, it would have been incorrectly concluded that culture is not associated with treatment adherence. As expected, results reflected an indirect effect of cultural beliefs about explicit social influence and susceptibility to social influence on diabetes treatment adherence. Due to the reality of living within a culturally diverse society, there is a need to test behaviors using a theoretically grounded approach that also integrates sociodemographic (e.g. ethnicity, SES), cultural (e.g. fatalism, collectivism, cultural beliefs about susceptibility to social influence), and psychological factors (e.g. perceived social support, symptoms of depression, and self-efficacy). This study utilized Betancourt's Integrative Model (Betancourt & Flynn, 2009; Betancourt et al., 2010) to examine the impact of cultural beliefs about social influence through diet self-efficacy on treatment adherence and HbA1c among people with T2D. This framework also provided a more complete understanding of what constitutes healthy diet behavior by considering the cultural context for diet adherence which is one of the most cited self-management

challenges among people with T2D. As chronic illnesses become more central to the discussion on health worldwide rather than treatments for acute illnesses, there is a need for research that identifies cultural factors pertinent to chronic illnesses. Previous research has found that cultural beliefs have an indirect effect on health behavior through psychological factors among people with T2D and among women who should be utilizing cancer screening (Betancourt et al., 2011; Ung et al., 2014). Evidence from this study reiterates the importance of identifying and testing the indirect effect of culture on health behavior, particularly when existing research cannot explain the variance in treatment adherence.

Individuals who reported that they had difficulty refusing food when it was offered as a sign of affection (i.e. cultural beliefs about susceptibility to social influence), also reported poorer diabetes self-care and poorly controlled glucose levels. If individuals feel more susceptible to other people's control, they are more likely to not adhere to the recommended diet for people with diabetes (Senécal, Nouwen, & White, 2000). Research findings reflected that cultural beliefs about susceptibility to social influence and poor diabetes self-care was mediated by diet self-efficacy. In addition, if participants felt more confident about adhering to their prescribed diet, they also reported higher diet treatment adherence. An important difference between both SEMs was that higher diet adherence was not associated with more controlled glucose levels (i.e. lower HbA1c), whereas poor diabetes self-care was significantly associated with uncontrolled glucose levels (i.e. higher HbA1c). This finding may highlight that an individual's poor diabetes self-care is more closely associated with HbA1c, an overall measure of treatment adherence, rather than a specific behavior (i.e. following a healthy eating plan). In addition, individuals

who reported poor diabetes self-care were overrepresented at low income levels, further highlighting the importance of using an integrated model for health behavior in order to explain uncontrolled HbA1c levels. However, cultural beliefs about social influence were not unilaterally associated with poor treatment adherence.

Interestingly, those who endorsed being explicitly pressured to eat unhealthily, left out at parties, and made fun of when adhering to their diet by other people (i.e. cultural beliefs about explicit social influence) then reported higher diet adherence. This relationship was mediated by how confident participants felt. In spite of endorsing social pressure to eat unhealthily, participants reported feeling *more* capable of adhering to their diet. Cultural beliefs about explicit social influence may be associated with “situational” self-efficacy, in which individuals feel confident maintaining their diet in high risk situations, such as visiting friends (Strecher, McEvoy, Becker, & Rosenstock, 1986). Those who feel more self-efficacious may also be better equipped to maintain their diet when faced with difficult barriers (Schwarzer, 2008; Senécal et al., 2000). Regardless, research findings support the strong association between individuals with high perceived self-efficacy and high treatment adherence (Heisler et al., 2005). Although self-efficacy may seem logically tied with an individualistic lifestyle, high perceived self-efficacy should not be equated with cultural constructs of individualism or pitted against collectivism (Bandura, 2000). Rather, culture shapes how self-efficacy beliefs “are developed, the purposes to which they are put, and the sociostructural arrangement under which they are best expressed” (Bandura, 2000, p. 3). Comparing sociodemographic groups (i.e. ethnicity, SES, age) may further explain the underlying mechanisms

impacting treatment adherence through cultural beliefs about explicit social influence and diet self-efficacy.

One of the strengths of this study was its heterogeneous sample, namely across ethnicity and socioeconomic status. The importance of collecting data from heterogeneous samples stems from research findings that individuals with T2D are overrepresented at low education and income levels (Cusi & Ocampo, 2011; Misra & Lager, 2007). Low SES is also associated with low diabetes knowledge and a decreased likelihood of using preventive health care services, resulting in a higher need for specialized care and higher risk factor profiles due to uncontrolled glucose levels (Zgibor & Songer, 2001). There was an overrepresentation of participants in this study with low income who also reported poor treatment adherence and uncontrolled HbA1c levels. Additionally, not identifying as Anglo is also associated with a significantly greater likelihood of diabetes (Cheung et al., 2009). Latinos who participated in this study also reported poorer treatment adherence and higher HbA1c levels in comparison with Anglos. Health disparities may have a direct and/or indirect effect on poor treatment adherence and HbA1c levels. The impact of income and ethnicity on treatment adherence would be more fully understood when considering the mediating effect of cultural beliefs and self-efficacy among groups that have historically experienced health disparities. Furthermore, the barriers and protective factors identified in this study for treatment adherence may be utilized to reduce persistent health disparities among disadvantaged groups with T2D in the United States.

Limitations

This study demonstrated the impact of cultural beliefs about social influence on treatment adherence and HbA1c. Some limitations should also be considered in light of research findings. First, because data collection was cross-sectional, caution should be exercised concerning generalization towards other populations as well as making causal inferences based on this study's findings. However, the strong conceptual foundation and goodness of fit among the SEMs demonstrated that cultural beliefs about social influence function similarly across a heterogeneous sample of Anglos, Latinos, African Americans, Asian Americans, and people who identified as multi-ethnic. Future research should examine whether cultural beliefs about social influence and diet self-efficacy are consistent over time and throughout the progression of T2D. Second, there may be some degree of social acceptability bias due to the use of self-report measures. However, the degree of socially desirable responding was accounted for and conceptually overlapped with cultural beliefs regarding susceptibility to social influence. These findings lend further support to the importance of designing culturally specific interventions that consider the role of socially desirable responding in self-efficacy and diabetes treatment adherence overall.

In addition to cross-sectional data collection, the sample size of the study was not large enough to conduct analyses to test within-group differences (i.e. between ethnic groups to examine whether or not cultural factors functioned similarly or differently), however, the cultural factor was generalizable across ethnic groups. Furthermore, SEMs reflected good fit with a relatively small sample, supporting the strength of the theoretical model that the study utilized for analyses. This sample also had an overrepresentation of

ethnic minorities and individuals with low socioeconomic status. Due to the presence of health disparities among these groups, research findings are contributing to a better understanding of how diet adherence functions among a heterogeneous group with T2D. Furthermore, this study aims to reflect findings that are more representative of sociodemographic groups that are disproportionately impacted by T2D, which will be further addressed in considerations for future research.

Suggested Interventions

Considering the role of *both* cultural and psychological factors on diet treatment adherence may more effectively reduce health disparities in psychological interventions aimed to improve treatment adherence. Diabetes self-management education (DSME) has been shown to effectively improve treatment adherence (i.e. HbA1c), particularly those that incorporate behavioral goal setting, psychosocial strategies, age appropriate programs, and ongoing support (Pimouguet, Le Goff, Thiébaut, Dartigues, & Helmer, 2011; Tang, Funnell, Noorulla, & Brown, 2012).

In addition to DSME, motivational interviewing (MI) has been widely utilized to improve self-efficacy for treatment adherence among people with T2D (Britt, Hudson, & Blampied, 2004; Greaves et al., 2008; Knight, McGowan, Dickens, & Bundy, 2006; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010; Martins & McNeil, 2009; Rubak, Sandbæk, Lauritzen, Borch-Johnsen, & Christensen, 2009). MI consists of enhancing intrinsic motivation and commitment to change. Providers strive to express empathy and develop discrepancy between desired and actual behaviors, acknowledge one's freedom of choice, and support self-efficacy (Martins & McNeil, 2009). Due to MI's emphasis on

the development of self-efficacy, healthcare providers have deemed it a logical intervention to utilize in health settings.

Despite the potential for MI to support diabetes treatment adherence, there are few controlled studies that have reflected large effects on health behavior change among people with T2D (Britt et al., 2004; Lundahl et al., 2010; Knight et al., 2006). Some interventions for people with T2D have been adapted for specific communities by integrating food common to the region into diet plans or translating interventions to the participants' first-language (Griffin, Gilliland, Perez, Helitzer, & Carter, 1999; Spencer et al., 2011). However, no known culturally sensitive interventions have been developed based on socially shared beliefs, values, norms, and expectations. Utilizing the cultural factors identified in this study regarding social influence among a heterogeneous sample may enhance the effectiveness of MI interventions designed to foster self-efficacy.

For example, having difficulty refusing food offered as a sign of affection would be readily identifiable as an important barrier to developing diet self-efficacy. Providers could then measure how susceptible a person with T2D feels in social contexts and focus on intervening in situations in which they feel susceptible to social pressure. Because this cultural factor was indirectly related to diet adherence, interventions for people with T2D should focus on beliefs about temptation and social norms surrounding food refusal. Providers could also differentiate between individuals with T2D who feel susceptible to social influence from those who report experiencing explicit social influence (i.e. "others leave them out of a party where there is eating or drinking"). Individuals who experience explicit social influence may still feel confident adhering to their diet despite the presence of barriers. Utilizing a culturally sensitive framework may help providers promote self-

efficacy among patients with T2D, and therefore, more effectively bridge the gap between the intention to change and engaging in measurable health behavior change (Schwarzer & Renner, 2000; Schwarzer, 2008).

Conclusions and Future Directions

In sum, this study demonstrated the importance of measuring both the direct and indirect of culture on health behavior. Had only the direct effect been examined, findings would incorrectly reflect that culture had no effect on diabetes treatment adherence. In support of hypotheses, specific cultural beliefs about social influence indirectly effected treatment adherence through diet self-efficacy. Betancourt's Integrative Model provided a framework in which to better understand the role specific cultural factors on diabetes treatment adherence. This study also measured a highly heterogeneous sample that identified multiple sociodemographic factors (i.e. ethnicity, SES, and age) correlated with cultural, psychological, and treatment adherence variables. Future research should focus on specifying the role of sociodemographic factors that contribute to cultural beliefs about social influence and further clarify underlying mechanisms to explain the variability in diabetes treatment adherence.

In an effort to develop culturally sensitive interventions such as the one proposed above, future directions for research should implement the bottom-up approach to identify additional cultural factors unique to people with T2D in the United States. Cultural factors identified from the bottom-up may further contribute to understanding barriers to T2D treatment adherence, such as diabetes fatalism and/or beliefs about the controllability of diabetes. The belief that events such as contracting diabetes is due to

fate, has been associated with low socioeconomic status and low treatment adherence (de los Monteros & Gallo, 2013), which may indicate that fatalism will be relevant to the participants in this sample who were overrepresented at low levels of income.

Alternatively, the belief that diabetes can be controlled may be associated with higher socioeconomic status. Fatalism and beliefs of controllability should be explored in relation to socioeconomic status in future studies.

In addition to sociodemographic, cultural, and psychological factors impacting people with T2D, future studies should also account for impact of the relationships with healthcare providers. Negative experiences with healthcare providers may deter people with T2D from seeking preventive services and health care in general, resulting in being diagnosed later, exhibiting more complicated risk-factor profiles, and developing more severe health outcomes such as neuropathy, kidney disease, heart disease, stroke, limb amputations, and death (Centers for Disease Control, 2014; Hutchinson & Shin, 2014; McKinlay, Piccolo, & Marceau, 2013). Unfortunately, people from ethnic minority groups report disproportionately higher levels of negative patient-provider interactions, such as unfair treatment, long wait times, poor communication, and a lack of respect (Amador et al., 2015). People who reported negative interactions with providers are less likely to receive optimal screening, not follow the provider's advice, delay care, and/or reduce continuity of care (Betancourt et al., 2011; Blanchard & Lurie, 2004; Blendon et al., 2008; Federman et al., 2001; Ryan, Gee, & Griffith, 2008). Thus, negative experiences with healthcare providers may ultimately jeopardize healthcare for a controllable disease such as T2D. Due to the potential to improve both healthcare treatment and health outcomes, examining perceived mistreatment and the attributions

that people with T2D make about treatment may elucidate how healthcare providers can improve relationships, particularly with those from historically disadvantaged groups.

The results of this study have several implications for future findings regarding diabetes treatment adherence, and may lead to improved clinical care and patient outcomes. By utilizing an integrative theory that includes influential factors that affect behavior (e.g. culturally shared beliefs and psychological factors), this study uniquely examined the indirect effect of culturally shared beliefs on self-management behavior. As a consequence, findings could inform culturally sensitive interventions that prevent serious complications related to uncontrolled T2D, and begin to address underlying mechanisms that may be driving health disparities. Furthermore, this study may contribute to programmatic research on health behavior that considers the structure of relations between cultural, psychological, and behavioral variables. Although the theoretical model underlying this study could be applied to a wide range of behaviors, this study in particular aims to better define the contribution of sociodemographic, cultural, and psychological factors on treatment adherence among diverse participants with T2D in the United States. Finally, this study highlighted both the barriers (i.e. susceptibility to social influence) and protective factors (i.e. diet self-efficacy) to successful diet adherence, and may facilitate the transition from research to application in order to more effectively prevent not only health complications, but also to reduce health disparities among T2D patients.

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APPENDIX A

RECRUITMENT EMAIL SCRIPT

Social Network, Email, Professional Listservs, etc.

Are you a person with Type 2 diabetes? You are receiving this email because you or someone you know expressed interest in this research study.

Our names are Sonika Ung and Nathalie Serna. We are graduate students under the supervision of Dr. Hector Betancourt who is a faculty member at Loma Linda University. We are conducting a study to examine the factors that influence the control of Type 2 diabetes and fulfill research requirements for our doctorate in psychology and we hope that you are interested in participating.

Would you like to participate in the study? If so, **please click on the link below and share this information with others you know with Type 2 diabetes.**

Follow this link to the Diabetes Survey:

`${l://SurveyLink?d=Take the survey}`

Or copy and paste the URL below into your internet browser:

`${l://SurveyURL}`

Sincerely,

Sonika Ung, M.A.
Ph.D. Candidate in Clinical Psychology
Loma Linda University, Department of Psychology

Follow the link to opt out of future emails: `${l://OptOutLink?d=Click here to unsubscribe}`

What does participation include?

Participation in this study involves answering questions about your demographics, cultural beliefs about individuals with Type 2 diabetes, thoughts and emotions related to Type 2 diabetes, and health behaviors such as diet and exercise. You are invited to be in this study because you have been diagnosed with *Type 2, are 18 years or older, and are living in the United States*. The survey will take approximately 30 minutes to complete. You will not be paid for your participation in the study but you have the opportunity to enter for a chance to win a **\$50 Amazon gift card**. You may stop answering questions at any time or choose not to submit your answers at the end, but you must complete the entire survey to be eligible for the gift certificate drawing.

There is a minimal risk of breach of confidentiality; however, this risk is greatly minimized by using software that allows you to complete and submit the survey anonymously. When we receive the results, no information will link your answers back to you.

Although you will not benefit directly from this study, your participation may help researchers better understand the cultural and psychological factors that influence following recommended treatment plans for individuals with Type 2 diabetes. Thank you in advance for considering this invitation.

APPENDIX B

IN-PERSON RECRUITMENT SCRIPT

Hello, would you be interested in completing a short survey for a chance to win \$50.00? My name is [*insert student researcher's name*], and I am a graduate student at Loma Linda University, supervised by Hector Betancourt, Ph.D. who is a faculty member at Loma Linda University. We are conducting a study on cultural and psychological factors that influence health behavior among type 2 diabetics, and were hoping you would be interested in participating.

You are eligible to participate if you are 18 years or older, have been diagnosed with Type 2 diabetes, and can read and respond to an online survey. Your responses are in no way linked to your name or address and the survey usually takes about 30 minutes to complete. The survey asks questions about your background, cultural beliefs, thoughts and feelings about diet and exercise, and health behaviors you engage in. Although you will not be paid for your participation in this study, at the end of the survey you have the option to enter for a chance to win a \$50.00 Amazon gift card.

The level of risk in this study is very low, such as the possibility of becoming distressed by the nature of survey questions, but you can leave the survey at any time. In order to be eligible for the gift card drawing, you will be asked to provide your name and contact information. This information will remain private, and will be separate from your responses to the survey. Although you will not benefit directly from this study, your participation in this survey will help us understand what cultural and psychological factors either disrupt or protect behaviors that keep type 2 diabetics healthy.

Participation is entirely voluntary. You may discontinue participation in the survey at anytime, but must complete the survey to be eligible for the gift certificate drawing. Do you have any questions? Would you like to participate in the study?

(If yes, investigators either provide a portable electronic device to complete survey in-person, or give the potential participant a card with the web address to the survey. This card will allow the potential participant to complete the survey at his or her convenience.)

APPENDIX C

RECRUITMENT CARD (FRONT AND BACK)



Loma Linda University
School of Behavioral Health

Are you a person with Type 2 diabetes?

YOUR PARTICIPATION IS NEEDED

Complete a 30 minute survey to enter a raffle for a **\$50 gift card** to Amazon.com!

To take this survey, please do one of the following:

- Enter this address into any internet browser:
<https://goo.gl/mQ0rqR>
- Email **culturebehaviorlab@gmail.com**
- Scan the QR code on this card



Your responses will be anonymous.
Please see back of card for more information →



Loma Linda University
School of Behavioral Health

What is the purpose of this research study?

- To understand how cultural beliefs, thoughts, and emotions influence health behaviors like diet and exercise.

Who can participate in this study?

- Those who have been diagnosed with Type 2 diabetes for one year or longer, are 18 years or older, *not* dependent on insulin, and who can read/respond to an online survey.

What are the risks to participating?

- The risks are very low, such as feeling irritated by some questions in the survey. Steps have been taken to lower this risk as much as possible.

What are the benefits of the study?

- Although you may not personally benefit from this study, your responses will help researchers better understand unique cultural and psychological factors of culturally diverse individuals who have been diagnosed with Type 2 diabetes.

What does participating include?

- Completing an online survey that will take about 30 minutes.

Who do I contact if I have questions?

- The Principal Investigator of this study, Hector Betancourt, Ph.D.
(909.558.8708).

APPENDIX D
RECRUITMENT FLIER



Loma Linda University
School of Behavioral Health

Are you a person with Type 2 diabetes?

YOUR PARTICIPATION IS NEEDED

Complete the survey to enter a raffle for a **\$50 gift card** to Amazon.com!

To take this survey, please do one of the following:

- Enter this address into any internet browser:
<https://goo.gl/mQ0rqr>
- Email **culturebehaviorlab@gmail.com**
- Scan the QR code on this flier



Please share this information with others you know with Type 2 diabetes.

What is the purpose of this research study?

- To understand how cultural beliefs, thoughts, and emotions influence health behaviors like diet and exercise.

Who can participate in this study?

- Those who have been diagnosed with Type 2 diabetes for one year or longer, are 18 years or older, *not* dependent on insulin, and who can read/respond to an online survey.

What are the risks to participating?

- The risks are very low, such as feeling irritated by some questions in the survey. Steps have been taken to lower this risk as much as possible.

What are the benefits of the study?

- Although you may not personally benefit from this study, your responses will help researchers better understand unique cultural and psychological factors of culturally diverse individuals who have been diagnosed with Type 2 diabetes.

What does participating include?

- Completing an online survey that will take about 30 minutes.

Who do I contact if I have questions?

- The Principal Investigator of this study, Hector Betancourt, Ph.D. (909.558.8708).

APPENDIX E

ANONYMOUS SURVEY INFORMED CONSENT

IRB # 5150309

February 2017

You are invited to participate in a survey about cultural beliefs, thoughts, and feelings about health behaviors like diet and exercise because you have been diagnosed with Type 2 diabetes and are 18 years or older. The general aim of this research is to examine the factors that influence the control of diabetes. This study's purpose is unique because most research does not consider how culture influences health behavior.

Participation in this study involves answering questions about your demographics, cultural beliefs about individuals with Type 2 diabetes, thoughts and emotions related to Type 2 diabetes, and health behaviors such as diet and exercise. The survey will take approximately 10-15 minutes to complete. You will not be paid for your participation in the study but at the end of the survey you have the opportunity to enter for a chance to win a \$50 Amazon gift card. You are free to discontinue participation in the survey at any time, but you must complete the entire survey to be eligible for the gift certificate drawing. Whether or not you participate is entirely voluntary and will not affect your relationship with the graduate students conducting the study, or with the community site where you were recruited.

Your responses will be confidential. Your name will not be on the survey so no one will know how you answer the questions. The risk that someone may see your answers is minimal, and because you will complete the survey without your name with many other surveys, this should not happen.

Although you will not benefit directly from this study, your participation may help researchers better understand the cultural and psychological factors that influence following recommended treatment plans for individuals with Type 2 diabetes.

You may contact an impartial third party not associated with this study regarding any question or complaint by calling 909.558.4647 or e-mailing patientrelations@llu.edu for information and assistance.

Thank you in advance for considering this invitation. If you have any questions, please give the supervisor Dr. Betancourt a call at 909.558.8706.

If you wish to proceed and participate in the survey after reading this letter, please click on "I agree with and I understand the information above." By selecting this, you are giving your consent to participate.

Sincerely,

Hector Betancourt, Ph.D., Principal Investigator
Patricia M. Flynn, Ph.D., Co-Principal Investigator
Sonika Ung, M.A., Student Investigator
Nathalie Serna, M.A., Student Investigator

SOCIODEMOGRAPHIC ITEMS








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<p>11. Were you born in the U.S.?</p> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <input type="checkbox"/> YES <input type="checkbox"/> NO </div> <div style="margin-top: 10px;"> <p>Skip to Question 16</p> <p style="color: red; font-weight: bold; font-size: 1.2em;">↓</p> </div> <div style="background-color: #cccccc; padding: 10px; margin-top: 10px; text-align: center;"> <p>Answer Questions 12 to 15</p> <p style="font-size: 2em; color: black;">➔</p> </div>	<p>12. What country were you born in? _____</p> <p>13. How many years have you lived in the U.S.? _____</p> <p>14. Who in your family was born in the U.S.? (Choose one or more)</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Your children </div> <div style="width: 50%;"> <input type="checkbox"/> Your mother </div> <div style="width: 50%;"> <input type="checkbox"/> No one </div> <div style="width: 50%;"> <input type="checkbox"/> Your siblings </div> <div style="width: 50%;"> <input type="checkbox"/> Your father </div> <div style="width: 50%;"> <input type="checkbox"/> Your father's parents (at least 1) </div> <div style="width: 50%;"> <input type="checkbox"/> Your mother's parents (at least 1) </div> </div> <p>15. What language is spoken at home? (Choose one or more)</p> <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> Other: _____ </div>
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<p>16. How well do you speak English?</p> <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> I do not speak English <input type="checkbox"/> Not well <input type="checkbox"/> Well <input type="checkbox"/> Very well </div>
<p>17. How long have you been diagnosed with Type 2 diabetes: _____</p>
<p>18. Are you currently taking medication to control your diabetes?</p> <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Yes <input type="checkbox"/> No </div>
<p>19. What was your most recent Hemoglobin A1c level?</p> <div style="display: flex; justify-content: space-between;"> <div> <p>Most scores range between 4.0 and 14.0</p> <p>A1c: ____ . ____</p> </div> <input type="checkbox"/> I don't know </div>


APPENDIX G

CULTURAL BELIEFS ABOUT SOCIAL INFLUENCE

Now please think about the reasons why people with diabetes may NOT follow their diet strictly or exercise regularly.	Strongly Disagree	<----->					Strongly Agree
							
1. Others pressure them if they do not eat or drink what everyone else is consuming.	1	2	3	4	5	6	7
2. Others leave them out at parties where there is eating or drinking.	1	2	3	4	5	6	7
3. Others make fun of them if they follow their diabetes diet strictly.	1	2	3	4	5	6	7
4. It is hard to refuse unhealthy food when friends and family members are eating those foods.	1	2	3	4	5	6	7
5. It is hard to refuse unhealthy food offered as a sign of affection.	1	2	3	4	5	6	7
6. It is hard not to join friends and family when they are eating foods that are not part of the diabetes diet.	1	2	3	4	5	6	7







Covariate (ranging from 0-7 days per week)

MARK BELOW THE CORRESPONDING NUMBER OF DAYS

How many days a week do you eat a meal with other people?		0	1	2	3	4	5	6	7
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APPENDIX H

DIET SELF-EFFICACY

How confident are you that you can...	Not Confident <-----> Very Confident						
							
manage your diabetes well overall.	1	2	3	4	5	6	7
follow the suggested diet to control your diabetes.	1	2	3	4	5	6	7
avoid food that is not part of your diet.	1	2	3	4	5	6	7
follow the diet recommended for individuals with diabetes when others eat food or consume drinks not part of the diet.	1	2	3	4	5	6	7
follow the diet when at a party with different foods.	1	2	3	4	5	6	7
follow the diet when other people insist that you eat other things.	1	2	3	4	5	6	7
follow the diet when you are worried or anxious.	1	2	3	4	5	6	7

APPENDIX I

SUMMARY OF DIABETES SELF-CARE ACTIVITIES (SELECTED ITEMS)

Now please respond to the following questions about the things you have done over the past SEVEN DAYS. If you have been sick the past few days, answer according to the last seven days before you were sick.	MARK BELOW THE CORRESPONDING NUMBER OF DAYS							
1. How many of the last SEVEN DAYS have you followed a healthful eating plan?	0	1	2	3	4	5	6	7
2. On average, OVER THE PAST MONTH, how many DAYS PER WEEK have you followed your eating plan?	0	1	2	3	4	5	6	7
3. IN GENERAL, how many times per week do you follow a healthy eating plan?	0	1	2	3	4	5	6	7
4. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?	0	1	2	3	4	5	6	7
5. On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products?	0	1	2	3	4	5	6	7
6. On how many of the last SEVEN DAYS did you eat sweets (candy, cake, ice-cream, etc.) or other foods high in carbohydrates (pasta, white bread, white rice, etc.)?	0	1	2	3	4	5	6	7
7. How many of the last SEVEN DAYS has your diabetes self-care been poor?	0	1	2	3	4	5	6	7

In the past month, what PERCENTAGE of the time did you...
...follow the diet your doctor recommended? 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%